N.A.C.A. BULLETIN

In Two Sections

Section One

PREDETERMINED PAYROLL FOR EFFICIENT LABOR ACCOUNTING AND COST CONTROL

by S. B. KINGHAM and T. E. HAUSER

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EDITORIAL DEPARTMENT NOTE

The advantages of knowing beforehand what may be expected to happen and, moreover, of so planning that this will be what *should* happen, are generally acknowledged by industrial accountants. The effort to apply such forethought effectively has produced standard cost, budgeting, and forecasting procedures which have sharpened the operating picture, present and future, for executive eyes.

Extensions of application of the preplanning concept involved are continually making their appearance. One such extended application in the field of labor accounting is presented in this issue of the *Bulletin* which is devoted to a predetermined payroll procedure in effect in one plant of a large steel company. What is meant by "predetermination" may be suggested by the fact that, under the procedure, each week's payroll is constructed in full detail in advance through calculation of gross pay, on the basis of planned labor for the week as scheduled by each foreman.

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PREDETERMINED PAYROLL FOR EFFICIENT LABOR ACCOUNTING AND COST CONTROL

by S. B. KINGHAM, Comptroller, and
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LABOR accounting for cost control and labor statistics, which has been in effect at one of National Tube's largest plants for some time, is designed primarily and fundamentally to give management control of labor costs *before* the cost is incurred. In addition, it provides a flexible low cost payroll system which, as a by-product, makes possible the obtaining of all types of labor statistics in connection with industrial relations matters, the development and administration of incentive plans, absenteeism, overtime, etc., rapidly and at low cost.

Objectives, Obstacles, and the Basic Plan

Historical cost data of the old actual cost variety, regardless of how soon it is available after the close of the month, has proved itself completely inadequate for the proper control of costs. Standard costs, through which variances are analyzed as to responsibility and causes, are a necessity today in order to properly service management. Even these are appreciably more valuable if the more important elements of controllable costs can be brought to the attention of management daily on an exception basis, and the unfavorable variances pointed out and explained. This type of service is extremely helpful to management and is a definite part of our program. But this also, although to a much lesser degree, is historical data. We can get even closer to present operating realities.

Standard Crew Size Suggests Practicability of Control

There are certain fundamental major components of costs that can be planned in advance and controlled before they occur and this includes payrolls. Those who are familiar with steel plants, and, as a matter of fact, industrial plants generally, know that it is necessary to have standard size crews for particular mills or machines. These take the form of authorized lists of the positions and the number of occupants for the operation of a particular facility. This reflects the conditions in a heavy industrial opera-

tion where substantial employment costs are incurred for servicing productive equipment and generally maintaining the plant. In the steel business, and others like it, the labor gang is a common appendage to each producing and service department. Recognition of this fact underlies the scheme of labor planning and control which we have adopted.

No small part of effecting the installation here described has been the selling of the program to local operating management. It should be emphasized that without the enthusiasm of the operators, from the general superintendent down, and the proper servicing of these operators by the accounting department, this very effective tool for cost control becomes little more than perhaps a good payroll system. It must be emphasized again that the procedure we are describing is, above all, a tool for cost control which, by coordination with the operating department, can be made extremely sharp and effective.

The Old System and the Specifications for the New One

It is necessary to discuss briefly the background of this program at National Works, a major steel producing and pipe manufacturing plant of the National Tube Company which, in turn, is an operating subsidiary of the United States Steel Corporation. At National Works, steel is produced from the basic raw materials into semifinished steel products for shipment to other plants and for further fabricating in our own plant for sale to the general trade as finished pipe and seamless tubular products. The payroll and timekeeping system in effect at National Works as recently as two years ago had several big disadvantages:

1. There were 27 decentralized time clock stations or timekeeping offices.
2. The system was not flexible. It could not render timely and adequate management and industrial relations service.
3. Controls, while theoretically good, were cumbersome and costly.
4. The ever-increasing requirements of payroll accounting, placed upon industry by legislative acts and by the demands of labor, had steadily overloaded the timekeeping and payroll bureaus.

We were fully aware of the inadequacies of the accounting setup and embarked upon a program to install a system which

would meet all of the demands of present-day conditions at the lowest possible cost. It was agreed that procedures should be developed to provide:

1. An adequate method for the determination of employee earnings, properly controlled and readily subject to audit.
2. Assured compliance with provisions of labor contracts and legislative acts.
3. Adequate individual employee earnings and service records.
4. Proper accounting distribution of labor expenditures.
5. Current data for control of costs for the benefit of mill and general office management.
6. Flexibility enough to afford guidance on any type of payroll information needed for contract negotiations.
7. Integration with the standard cost system.

We proceeded to devise and put into effect as rapidly as practicable a plan designed to achieve these objectives, first reducing clock stations to twelve from the previous total of twenty-seven. After months of study, test applications were made in certain departments to obtain the benefit of actual operation on a limited scale prior to complete plant-wide installation.

Dependence on Good Labor Scheduling

We started by making analyses of our labor accounting requirements, existing and anticipated. We drew upon our own experience and the experience of others in labor accounting. We took the best proven features of labor accounting and combined them in a system engineered to meet our requirements. It was decided that the method of "accounting by exception" would not only effect the control so much desired but would also come closest to simplifying and reducing our clerical effort. And, because of our large work volume, it was likewise decided that our records would have to be as completely mechanized as possible.

Before exceptions can be disclosed, a base must be established. To do this, we found a way to predetermine each employee's earnings for a week in advance. If the employee works the hours and the occupation on the turn scheduled, he is paid the precalculated amount of money. If he does not work as scheduled, we increase or reduce his total predetermined earnings accordingly. That is an exception and we do not let it slip by us without knowing the

reason for it. The principle of exception accounting built into the system also achieved the objective of reducing our card volume and permitting us to obtain quickly much needed statistical information for control and other objectives. As is well known, the retarding effect of large card volume on the production of timely and accurate cost and statistical reports is particularly acute during month-end peak load conditions.

It was not enough, however, for predetermination of payroll to be ideal for control and economical expenditure of clerical time and effort. It had to be practical right down to the shop level. We had to have good scheduling of labor. Was it possible to schedule labor accurately enough in our plant to meet the requirements of a predetermined payroll system? We all asked this question for, in our mill, many types of weekly schedules existed. Some units were scheduled three turns a day on a 21, 18, or 15 turn basis. Other units were scheduled two turns a day on a 14, 12, or 10 turn basis. Still others were scheduled straight daylight on a 7, 6, or 5 turn basis. Some of these schedules were fixed. Others were variable. It would seem that with these many varied schedules, 250 foremen, and 1,000 occupations, a high level of exceptions would exist.

Several other conditions also had to be considered. A large proportion of our employees "swing turns," i.e., change turn from week to week with different days off between each work week, varying with the type of schedule. Since shift differentials paid depend on the turn worked, we have many cases of men being paid on two different shift bases within the same calendar week. In our plant, too, with the exception of trade and craft and some clerical and technical occupations, we pay our employees for the type of work they do. This practice results in employees being paid for a number of different occupations within the same week —sometimes even within the same turn. It will become clear as we progress that, despite these circumstances, we have been able to preschedule our men on specific work and that, this accomplished, the objectives of control and efficient processing of payroll have been advanced. Yet, it is doubtful that it could have been done without detailed basic coding of labor operations and the use of tabulating equipment.

Payroll Code; Use of Tabulating Equipment

The answer to the perplexing problem of variety of turns, operations, and rates lay rather naturally in the use of punched cards,

and in coding of data. Prior to our new labor accounting system, we were using tabulating punched card equipment. Research disclosed that this equipment would meet our requirements and make it possible for us to mechanize completely.

A punch card system is only as good as the codes with which it works. Codes are tools which must be skillfully designed—tools to get accurate payrolls, accurate cost distribution, timely cost statistics, tools to help us in serving management. The foundation on which this labor accounting system had to be built was a sound labor code, a code which would be compact but comprehensive. Since we did not have one, we had to develop one. Our first and major job then was to engineer and install a completely new and integrated labor code.

Months of work went into this phase of the program. Cost and labor statistics requirements had to be analyzed to determine present and anticipated needs. The whole field of labor cost distribution had to be studied. Each incentive plan had to be examined for inherent peculiarities. During this period we drew help from many sources: line men with long experience in the timekeeping, payroll, and cost bureaus and staff men from cost planning and statistical divisions. Procedure staff men were employed, trained, and utilized. Close coordination with operating management, industrial engineering, and industrial relations departments had to exist during this entire development period. Exhibit 1 presents a picture of the resulting labor statistics codes.

Actually three labor codes are shown:

1. A four-digit occupation code.
2. A two-digit incentive plan code.
3. A two-digit job class code.

The first digit of the occupation code breaks down all labor on a broad general "type of labor" basis: supervisory, clerical, technical, protection, service labor, operating labor, direct, and indirect. This initial four-digit code as a whole not only classifies the occupations for our own works cost and expense requirements but also brings together related jobs for any types of studies such as those that might arise out of a new wage contract relating to trades and crafts, assigned maintenance, or labor statistics in general.

In addition to the occupation code, the two-digit code which identifies each incentive plan permits the segregation of nonin-

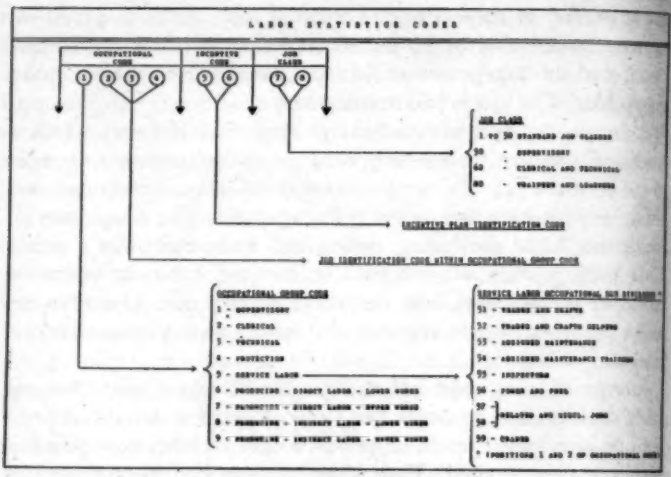

LABOR STATISTICS CODES
OCCUPATIONAL CODE
INCENTIVE CODE
JOB CLASS
1 2 3 4
5 6
7 8
JOB CLASS
1 TO 30 STANDARD AND CLASSED
30 - SUPERVISORY
60 - CLERICAL AND TECHNICAL
80 - TRAINEES AND LEARNERS
INCENTIVE PLAN IDENTIFICATION CODE
JOB IDENTIFICATION CODE WITHIN OCCUPATIONAL GROUP CODE
OCCUPATIONAL GROUP CODE
1 - SUPERVISORY
2 - CLERICAL
3 - TECHNICAL
4 - PROTECTION
5 - SERVICE LABOR
6 - PRODUCING - DIRECT LABOR - LOWER WAGES
7 - PRODUCING - DIRECT LABOR - HIGHER WAGES
8 - PRODUCING - INDIRECT LABOR - LOWER WAGES
9 - PRODUCING - INDIRECT LABOR - HIGHER WAGES
SERVICE LABOR OCCUPATIONAL SUB DIVISION *
51 - TRADES AND CRAFTS
52 - TRADES AND CRAFTS HELPERS
53 - ASSIGNED MAINTENANCE
54 - ASSIGNED MAINTENANCE TRAINEES
55 - INSPECTORS
56 - POWER AND FUEL
57 - HELPERS AND MISCL. JOBS
58 - HELPERS AND MISCL. JOBS
59 - CRANES
* POSITIONS 1 AND 2 OF OCCUPATIONAL CODE

EXHIBIT 1

centive occupations from incentive occupations and is used for: (1) daily, weekly, and monthly statistical studies, (2) detailed studies of earnings, required by management for administering incentive plans and initiation of new incentive plans, and (3) for all other incentive plan studies. The two-digit job class code is used for automatic computations, automatic proof of extensions, and audit of the rating of each occupation.

FROM WORK SCHEDULE TO PAY ENVELOPE

So far we have avoided the specific procedures involved in our payroll system. We have covered (1) its necessity—implicit in the inadequacy of the old system to operate economically or to control costs effectively, (2) the nature and general extent of studies undertaken to devise the new system, and (3) the decisions taken in the face of difficulties to preschedule labor to the last man in order to predetermine each week's payroll before the start of the week and to make use of exceptions to each man's predetermined work and pay, for the purposes of correcting the payroll and maintaining control of labor costs. We have likewise covered and illustrated the detailed code established to identify and classify our labor operations. With this in hand, we can go forward to the forms and procedures through which the payroll system now works. This description will occupy substantially the remainder

of the article. In the present section, the procedure will carry us through the steps under which the system is in operation *as a payroll system.* It will be followed by a section devoted to the uses of the system *as a management service* in connection with a wide variety of labor matters.

Throughout the description, our employment of tabulating equipment will be apparent. It is thought unnecessary to reproduce the types of cards punched. Suffice it to say that wherever the exhibits evidently consist of a machine listing, such listing of necessity implies punched cards for each employee or classification for the data shown. It will be quickly understood in most instances that the data required is supplied by the labor statistics code illustrated in Exhibit 1 or elsewhere in employee records or else from the successive procedures which form the steps from the initial scheduling of labor, to the pay envelope, to informative employee performance records, and to the management service reports which have been referred to.

The following exhibits set forth the mechanics of payroll assembly and are covered in this section of the paper:

Exhibit 2. Work Schedule.
Exhibit 3. Time Record.
Exhibit 4. Time Cards.
Exhibit 5. Predetermined Gross Payroll.
Exhibit 6. Weekly Gross Payroll and Employee Gross Earnings Statement.
Exhibit 7. Net Payroll Register.
Exhibit 8. Employees Net Earnings Ledger.
Exhibit 9. Pay Envelope.

Throughout the narration of the steps related to these forms, it will be found that we are following figures related to a single group of men, a crew, but principally two of its members, J. R. Miller and E. W. Jackson.

The Work Schedule to the Foreman

We are now ready to go into the actual operation of our labor accounting system. The first step is preparation of the Work Schedule (Exhibit 2). The work schedule is printed prior to the beginning of each week and is delivered to the foreman for scheduling. Here he finds only the men and the occupations which he

WORK SCHEDULE

WEEK STARTING 2 8 48 CONTROL NO. 217

OCCUPATION TITLE / EMPLOYEE NAME	CLOCK NO.	SEX M/F	SOCIAL SECURITY NO.	INSURED	HOURLY RATE	TURN 1	TURN 2	TURN 3
NORMALIZER HEATER		770 00 0121	328 40 6130	7	530	8 8 8	8 8	
JP GALLAGHER	6094							
MJ PUSSATI	6095						8 8	
NORM HEATER HELPER		770 10 0041	328 40 6130	7	210	8 8 8		
MJ PUSSATI	6095						8 8 8	
BH BROWN	6096						8 8 8	
STAMPER		770 40 0031	328 40 6130	7	170		8	
BH BROWN	6096							
JR MILLER	6097					8 8	8 8 8	
EH JACKSON	6098						8	

(Red Tint) (Green Tint) (White)

E.M.H.H.B.T. 2

normally schedules. His work on it is represented by the longhand "8s" which appear on the exhibit. The exhibited work schedule goes to Foreman No. 7 in Clock Station No. 13. In the first occupation listed, there will be noted, preprinted, the entire labor coding for the occupation. Occupation code 7700 is a normalizer heater. The "7" indicates that the occupation is a producing occupation, direct labor, and located in the pipe mills. Incentive code "00" tells us that it is a nonincentive occupation and a classified job bearing a rate of $1.53 per hour. (Our recent wage inequity elimination program resulted in the classification of all production and maintenance occupations into thirty job class rates.) The responsibility cost center and operation identify the job to our No. 1 normalizing furnace. The foreman does not have to concern himself with the code. The foreman will schedule Miller by name on the occupation, stamper, not clock number 6097 or occupation 7704. Thus, we simplify and reduce the possibility of error in the foreman's scheduling. We have placed the responsibility for the accuracy of the coding in the accounting department, but have definitely identified it with the foreman's scheduling. This has resulted in an accurate payroll and better labor distribution. The scheduling sections of the work schedules for the first, second, and third turns are printed in different colors to correspond to the standard colors used in the plant to designate attendance time on the first, second, and third turns.

In this work schedule we see the principal of cost control making its appearance before the cost is incurred. (Incidentaly, we are now in the process of correlating the work schedule with the budget so that the only occupations and number of employees available to the foreman for scheduling will be those allowed in the budget). We found that even the simple device of formalizing the act of scheduling is a valuable psychological aid to cost control. It is also an accurate basis for determining absenteeism. The foreman can now schedule his men by occupation for the ensuing week based on the anticipated production schedule. The days when foremen were permitted to schedule an indeterminate number of men to cover the maximum requirements for the week were most inefficient. The work schedule was a start in the direction of increased efficiency in the scheduling of labor. It gave the foreman a tool to help him keep his costs in line.

By adhering as much as possible to past standard practice, we minimized the impact of a new payroll system on the hundreds

TIME RECORD — WEEK STARTING 02 08 48 — CONTROL NO 3

OCCUPATION TITLE / EMPLOYEE NAME	CLOCK NO	OCC NO	INSURED	HOURLY RATE	DAILY HOURS							WEEKLY HOURS TOTAL	
					SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY		
NORMALIZER HEATER		7700001213	28406130 7	1530									
JP GALLAGHER	6094	3			8	8	8			8	8	40	1
NJ PUSSATI	6095	3						8	8			16	1
NORM HEATER HELPER		7701000413	28406130 7	1210									
NJ PUSSATI	6095	3			8	8	8					24	1
BN BROWN	6096	3						8	8	8	8	32	1
STAMPER		7704000313	28406130 7	1170									
BN BROWN	6096	3					8					8	1
JP MILLER	6097	3			8	8			8	8	8	40	1
EW JACKSON	6098	3						8				8	1
					24	24	24	24	24	24	24	168	

EXHIBIT 3

of employees involved. It is not our intention to give the impression that the installation of this phase of the program was easy. It was not. We knew that an installation as comprehensive as this one would not be possible without complete coordination between operating management and the accounting department.

The Work Schedule from the Foreman

Exhibit 2 also shows how this particular foreman scheduled his men. All men have now been scheduled for the week starting February 8. The foreman had only to write his numeral "8" in the proper turn and day blocks. Miller, for example, has been scheduled on the occupation, stamper, for the first turn each day on Sunday and Monday. His scheduled days off are Tuesday and Wednesday. He is scheduled again on Thursday, Friday, and Saturday. In the example, the No. 1 normalizing furnace has been scheduled for full twenty-one turn operation and, as a result, it was necessary to man the stamper's occupation the full seven days of the week. In this case the foreman scheduled Brown on Tuesday and Jackson on Wednesday to supply Miller's days off. On this exhibit it will be noted that two of the men are scheduled on two occupations each. As previously stated, a man may be scheduled or may work on a number of occupations during a turn or week.

The work schedule is then forwarded to the tabulating bureau and becomes the basis of the time record, clock cards, predetermined payroll, and labor distribution for the week.

Weekly Time Record and Clock Cards

The Time Record (Exhibit 3) at the beginning of the week is a predetermined record developed from the work schedule. In those cases where the man does not work as scheduled, the clock station attendant deletes the eight hours scheduled and manually inserts a numeral "8" under the occupation actually worked. This converts the time record to the actual record of hours worked by occupation by individual. The foreman also receives his copy of the time record at the beginning of the week. It is his personal property, his record of the men he scheduled.

By using the exception method in handling this form and later steps of payroll accounting, we realized a reduction in payroll and timekeeping personnel. At present our exceptions are approximately eighteen per cent. We are confident that as more experi-

EJ JACKSON
06098
6098
JB MILLER
06097
6097
N BROWN
06096
6096
NJ PUSSATI
06095
6095
JB GALLAGHER
06094
6094
NATIONAL TUBE CO. - NATIONAL WORM
EMPLOYEES CLOCK CARD
ALL - TIME - RULES
1. DO NOT SEND, TEAR OR MUTILATE CARD
2. EACH EMPLOYEE MUST REGISTER HIS OWN CLOCK CARD. NO EMPLOYEE SHALL REGISTER ANY OTHER CLOCK CARD OTHER THAN HIS OWN. ALL VIOLATIONS WILL BE SUBJECT TO DISMISSAL
3. IF AN EMPLOYEE FINDS HIS CARD MISSING, HE MUST REPORT IMMEDIATELY TO THE FOREMAN OR TIMEKEEPER IF TO BE NOTIFIED IMMEDIATELY
FINE CARDS
DAY
SUN
MON
TUE
WED
THU
FRI
SAT

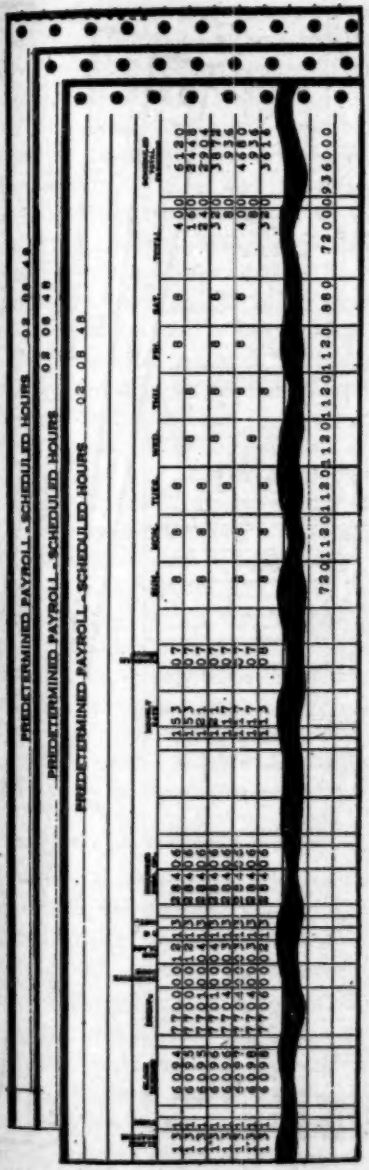

PREDETERMINED PAYROLL - SCHEDULED HOURS 02 08 48
PREDETERMINED PAYROLL - SCHEDULED HOURS 02 08 48
PREDETERMINED PAYROLL - SCHEDULED HOURS 02 08 48

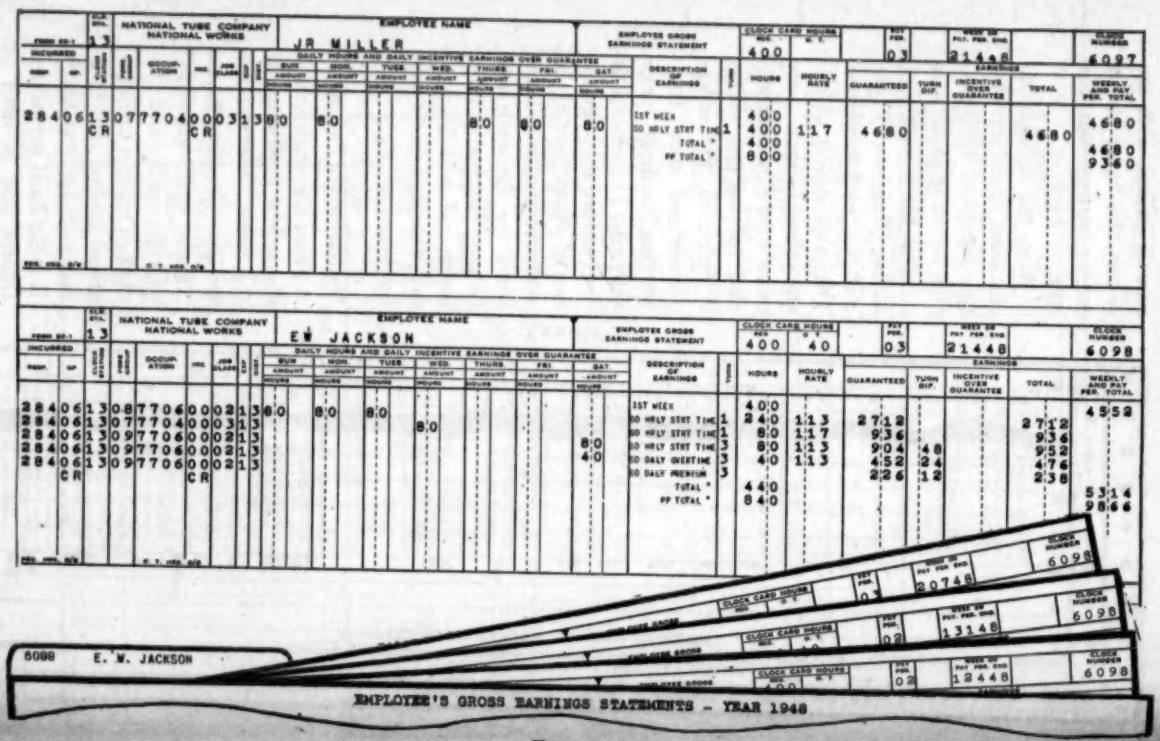
EXHIBIT 5

ence is gained with the system, this figure can be cut to perhaps ten per cent.

When the clock station attendant receives his time record at the beginning of the week, he also receives his weekly time cards (Exhibit 4) one card for each employee. The clock station attendant should rack only cards of the men scheduled for the turn. This is intended to control unscheduled men from working without prior authority, i.e., control of costs before they are incurred. At the end of the week, the total attendance hours for the week will be gang punched to these cards and will be used to mechanically audit payroll hours.

Predetermined Payroll

From the work schedule at the beginning of the week, we prepare weekly predetermined "hours and earnings" payroll cards and list them. This is a predetermined payroll and is illustrated by Exhibit 5. It is the basis for payroll control and is used to



EMPLOYEE'S GROSS EARNINGS STATEMENTS - YEAR 1948

Exhibit 6

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It
ea
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balance the other predetermined records, the precalculated labor distribution as well as the scheduled hours on the time record. Daily exceptions, when applied to this control, produce an actual payroll control for all labor.

Here we see clock number 6097 scheduled on the occupation, stamper. Going to the work schedule again we find that clock number 6097 is Miller and that he was scheduled 40 hours as has been described at rate of $1.17 per hour and that the time record, Exhibit 3, reflects these hours. Miller's earnings show on the predetermined payroll as $46.80. He will probably work as scheduled and will earn $46.80. Miller's gross payroll is completely computed, ready for audit before the week starts.

At the end of the week, a clock card audit is made. Actual weekly attendance hours in each time card are mechanically zero-balanced against the sum of payroll hours in the payroll cards by clock number. A mechanical rate audit is also made at the end of each week and likewise an audit of all individually rated employees. This audit assures us that we are paying only the individuals who are properly authorized to work trade and craft, clerical, and technical occupations.

Before going any further, let us review what we have covered. We have sent the work schedule to the foreman and had him schedule his men. We then produced a weekly time record, weekly payroll cards, weekly labor distribution cards, weekly clock cards, and a predetermined payroll. We set up controls for payroll and labor distribution to which we processed exceptions each day and adjusted payroll and labor distribution to actual. We have also provided for mechanical hour and rate audits.

The Weekly Gross Payroll

At the end of the week, after the rate and extension audits have been made, the payroll cards are listed to prepare a weekly gross payroll (upper portion of Exhibit 6). Employee time cards are included in this operation and the clock card audit referred to is obtained at this point. Thus one operation produces simultaneously (1) a weekly gross payroll, (2) employees' gross earnings statements. (3) employees' gross earnings ledger, and (4) the clock card audit.

It will be noted that complete occupational detail is shown for each employee. Employee Miller did work as scheduled and he did earn the amount shown on the predetermined payroll.

NATIONAL TUBE COMPANY
NATIONAL WORKS

PAYROLL REGISTER

PAY PERIOD ENDING 02 14 48

EMPLOYEE NAME	CLOCK NUMBER	SOCIAL SECURITY NUMBER	WITHHOLDING TAX TO DATE	EARNINGS YEAR TO DATE	HOURS TO DATE	HOURS THIS PAY	GROSS EARNINGS	WITH-TAX	O.A.S.I.	INS.	UNION DUES & HOSP.	OTHER DEDUCTIONS	NET PAY
JR MILLER	6097	294054317	3340	38240	3200	800	9360	870	94		100	500	7796
EW JACKSON	6098	291076485	3870	39646	3320	840	9866	960	99		100	675	8032
MB RILEY	6099	173126280	4260	39284	2440	800	12720	1420	127	193	100		10880
RL WILSON	6103	194074472	3390	40822	2430	720	10860	1139	109		100	600	8921
WT JAMES	6104	173075649	3300	42856	2520	640	10625	1100	106		100		9319

EXHIBIT 7

PAY PERIOD	CLOCK NUMBER	SOCIAL SECURITY NO.	EMPLOYEES NAME	SEX	SINGLE - 1 MARRIED - 2	TAX EXEMPTION	YEAR	SERVICE CALCULATING DATE	YEARS OF CONTINUOUS SERVICE		CLOCK NUMBER	PAY PERIOD
	6098	291076485	EW JACKSON	M	2	2	1948	21347	24		6098	

PAY PERIOD	CLOCK NUMBER	SOCIAL SECURITY NO.	WITH. TAX TO DATE	EARNINGS TO DATE	HOURS TO DATE	HOURS	GROSS EARNINGS	WITH. TAX	O.A.S.I.	INSURANCE	UNION DUES HOSP.	OTHER DEDUCTIONS	NET PAY	REMARKS	PAY PERIOD
24	6098	291076485	900	9504	800	800	9504	900	95	193	100		8216		24
1	6098	291076485	1890	19550	1640	840	10046	990	100				8956		1
2	6098	291076485	2910	29780	2480	840	10230	1020	102	193			8915		2
3	6098	291076485	3870	39646	3320	840	9866	960	99		100	675	8032		3
4															4
5															5
6															6
7															7
8															8
22															22
23															23
24															24
25															25
26															26

NATIONAL TUBE COMPANY
NATIONAL WORKS

EMPLOYEES NET EARNINGS LEDGER

EXHIBIT 8

The weekly gross payroll exhibits hours worked each day by occupation, showing rates paid, occupational earnings, and turn differential amounts paid. Overtime hours worked are exhibited separately showing "straight time" earnings, overtime premium earnings, and turn differential amounts. It may be noted too, in the example, that "last week's" hours and earnings are carried forward to this week's statement, to exhibit total hours and gross earnings for the biweekly pay period. Attendance hours are also printed for each employee as well as the results of the clock card audit. The "CR"—"CR" in the lower left-hand corner of each statement indicates that attendance hours in the employee's time card have been zero-balanced with the sum of payroll hours going into gross payroll.

The weekly gross payroll is nothing more than the old open face payroll mechanized. Here we collect in one compact record all the occupational detail behind each employee's gross earnings.

Employee's Gross Earnings Statement

The duplicate and triplicate copies of the weekly gross payroll are perforated and separated into strips. These are Employee's Gross Earnings Statements and are assembled as indicated at the bottom of Exhibit 6. The triplicate can be given to the employee. The duplicate is filed and becomes the company's ledger record, an occupational history of each employee. From an industrial relations viewpoint, this earnings statement is most desirable. An employee should know what makes up his earnings. He wants to know at what rate he was paid, how much his overtime premium amounted to, etc.

From the company's standpoint, the gross earnings ledger record is invaluable, will become more so as the years go on. Many times it is necessary to dig into past history. What a time-consuming job this can be if the records are bulky and unwieldy. At National Works, we particularly need compact employee's gross earnings ledgers. The cancellation of an incentive plan requires that we go back and develop average hourly earnings for a period of three months for each individual working under the plan. Questions of seniority are always arising, requiring us to trace back a man by occupations, sometimes for a period of several years.

The granting of retroactive pay presents a real problem in this respect. Our recently completed wage inequity elimination program involved the reconstruction of each wage employee's earn-

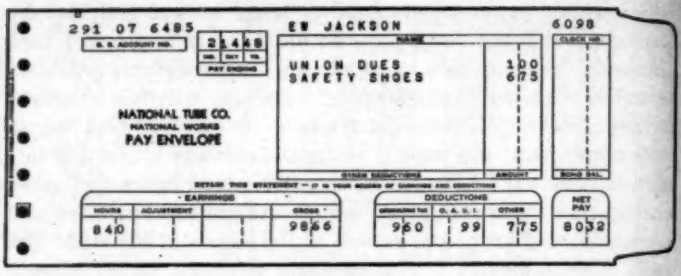

EXHIBIT 9

ings by occupation covering a period of three years. Thousands of hours were spent assembling the required earnings data. Seven million tabulating cards were processed. If we had had available for that period an employee's gross earnings ledger such as is illustrated, the cost of the program could have been reduced by 75 per cent.

The employee's gross earnings ledger will also facilitate the making of analytical studies of employee earnings in connection with:

1. Individual incentive plan earnings for each employee.
2. Employees working less than 40 hours a week.
3. Overtime worked.
4. Vacations.

The Net Payroll Register and Employee's Net Earnings Ledger

We will now move briefly into the subject of net payroll. Gross to net procedures are more or less standard. On the net Payroll Register (Exhibit 7) we show gross earnings, various types of deductions, and net pay. By mechanically "transfer posting" from the net payroll register, entries are made to Employee's Net Earnings Ledger (Exhibit 8).

This particular feature of the system is most important to us. For purposes of computing vacation pay rates (which are based upon the average hourly earnings during the first two of the last three closed pay periods worked by the employee preceding the first week of the actual vacation period), the record is a great saving in clerical effort. Our wage employees get a vacation of one week after one year of service, two weeks after five, and three weeks after twenty-five years of service. In all cases, the anniversary date determines the years of service for this purpose. Note

that Jackson's anniversary date is September 13 and that he completed 24 years this year and is therefore entitled to a three-weeks vacation at that date.

The Pay Envelope

The pay envelope is shown as Exhibit 9. We include on it gross earnings, the detail of deductions, and net pay. Our pay envelopes are printed on continuous forms from the same payroll cards as are used in the preparation of the net payroll register.

Services to Management

From the foregoing sections of this article, it will be clear that the payroll system gives us an accurate payroll and one which is easy to audit. It gives individual employee earnings and service records and proper routine accounting distribution of labor expenditures. The next phase of this discussion will cover the relationship of our labor accounting system to the standard cost program and its part in the providing of service to management and the reporting of statistical information which has become so vital to informed decisions as to be regarded as wholly necessary.

In this phase of the program we have tried to follow three general objectives:

1. Reports designed specifically for each level of management in order to give top management summarized reports on broad general groupings and to give the department and foreman level the necessary detail to control costs.
2. Interpretation of causes for conditions indicated in reports. To do this we have established a decentralized cost analytical group which works in the mill directly with department and foreman level supervision.
3. Flexibility in the mechanics of reporting. We want to be prepared to revise, discontinue, or initiate reports as conditions and needs change. To illustrate the manner in which these goals are held in view, a few of our current reports to management are discussed in the succeeding paragraphs. We have selected those which we believe will be of the most general interest.

Not all of these reports relate solely to labor or are direct products of the tabulating equipment which processes the assembly of

NATIONAL TUBE COMPANY - NATIONAL WORKS
SEAMLESS FINISHING - DAILY LABOR COST

DATE: MARCH 26, 1942

OPERATION		DIRECT LABOR				DELAY TIME			
DESCRIPTION	NO.	BUDGET	ACTUAL	VARIANCE DAY	VARIANCE TO DATE	BUDGET	ACTUAL	VARIANCE DAY	VARIANCE TO DATE
RESP. 203 - NO. 1 FLOOR									
CUTTING-OFF SEMI-AUTO	01&11	61	68	7cr.	73	21	32	11cr.	23
CUTTING-OFF	02	17	18	6cr.	16	1	4	3cr.	10
THREADING-HYDRAULIC	03	-	-	-	3cr.	-	-	-	7cr.
THREADING	04	92	104	12cr.	93cr.	23	34	11cr.	9
[illegible]	05	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TEST [illegible]	[illegible]	[illegible]	[illegible]	-	65	3	-	3	[illegible]
SWING GRINDING	34	17	24	7cr.	23				
REAMING & FACING	36	-	1	1cr.	57	-	-	-	41
CUTTING-OFF	37	7	8	6cr.	17cr.	1	3	2cr.	12cr.
THREADING	39	6	17	11cr.	13cr.	3	4	1cr.	17cr.
TOTAL RESP. 203		599	640	41cr.	187	118	137	19cr.	77cr.

EXHIBIT 10

labor costs in the way which has been outlined. However, all these reports are more ample and informative by reason of our predetermined payroll system and more promptly issued because of the principle of predetermination employed and because of the use of mechanical equipment. The reports which have been chosen for illustration and for comment below are:

Exhibit 10. Daily Labor Cost.
Exhibit 11.* Daily Cost Above (above material).
Exhibit 12.* Responsibility Statement.
Exhibit 13.* Consolidated Works Expense Statement.
Exhibit 14.* Summary of Consolidated Works Expense Statement.
Exhibit 15. Occupational Report.
Exhibit 16. Paid for Delay Time.
Exhibit 17. Fair Day's Work Program.
Exhibit 18. Excessive Absenteeism.

* Includes data in addition to labor cost data.

Daily Cost Reports; Monthly Responsibility Statements

Direct labor and delay time costs are detailed by operation on a daily direct labor and delay time report (Exhibit 10). For each operation, actual cost is compared with budgeted cost and the

variance developed. Of considerable importance among these reports is also a daily cost report (Exhibit 11), designed to give department level supervision cost information on a current day-to-day basis. This includes both labor and other expense data. A daily cost report is prepared for each producing responsibility and presents daily cost according to detail labor and other expense classifications. Variances are developed as in respect of the daily labor cost report.

At the end of the month a Responsibility Statement (Exhibit 12) is prepared for each of our 175 responsibility cost centers. This report is aimed directly at the departmental level of management, i.e., aimed directly at cost control. Costs are shown in complete detail and for each item of cost, actual is compared with budget, and the variance this month, last month, and year to date exhibited. Prior to the installation of our new labor accounting system, this report was prepared but in considerably less detail, and was not available until after the twenty-fifth of the month. The preparation of this statement has been mechanized and use made of a reproduction method. Today it is scheduled for the

NATIONAL TUBE COMPANY - NATIONAL WORKS
SEAMLESS FINISHING DIVISION
DEPARTMENTAL DAILY COST ABOVE

DATE: MARCH 26, 1948

ACCOUNT TITLE	RESP. 283 NO. 2 SEAMLESS FINISHING				RESP. 286 UPSET AND NORMALIZE			
	BUDGET	ACTUAL	VARIANCE DAY	VARIANCE TO DATE	BUDGET	ACTUAL	VARIANCE DAY	VARIANCE TO DATE
DIRECT LABOR	599	640	41cr.	187	897	510	77	410
INDIRECT LABOR	317	389	72cr.	157	118	165	47cr.	67
DELAY TIME	118	137	19cr.	373	173	104	19	105
SUPERV., TECH. & CLER. LABOR	67	67	5cr.	67cr.	33	27	6	16
LABOR MEMOING	-	-	-	47cr.	-	-	-	10cr.
LABORATORY	79	40			53	47	6	
INSPECTION CHARGES	169	194	25cr.	54cr.	-	-	-	-
TOTAL COST ABOVE	2484	2908	64cr.	1567	1977	1781	196	967

EXHIBIT 11

RESPONSIBILITY STATEMENT — CENTS OMITTED

RESPONSIBILITY: SEAMLESS FINISHING — NUMBER: 283

SUPERVISOR: L W SEEGER — DATE: MAR 1948

NATIONAL TUBE CO.
NATIONAL WORKS

ACCOUNT TITLE	WORK CODE	BUDGET	ACTUAL	VARIANCES THIS MONTH	%	LAST MONTH	%	TO DATE
MATERIALS		150352	149933	419		819 CR		400 CR
OPER WAGE DIRECT	1111	3837	3879	42 CR		32 CR		74 CR
OPER WAGE INDIRECT		2163	2162					746
SPARE LABOR	8140	1452		164		161		
DEPT SUPTS CHARGES	8820	3830	3339	491		494		985
INSPECTION CHARGES	8840	2589	2226	363		344		706
TOTAL		175363	173953	1410		806		4326
EARNINGS		175596						
VOLUME VARIANCE				159		196		355
UNIT COST S E H		7569		7596		7159		7567
UNITS TONS PROD		1693		2320				

EXHIBIT 12

NATIONAL TUBE COMPANY - NATIONAL WORKS
CONSOLIDATED WORKS EXPENSE STATEMENT

Month of MARCH - 1948

ACCOUNT TITLE	ACCOUNT NUMBER	COST ABOVE	DISTRIBUTED COST	ACTUAL AT STANDARD	BUDGET	USAGE VARIANCE
MATERIALS			2247067 90	2247067 90	2236425 10	10642 80 CR
OPER WAGE DIRECT	1111	32931 18	4410 CR	32887 08	34348 80	1461 72
OPER WAGE INDIRECT	1112	24985 60	3530 CR	24950 30	27988 20	3037 90
PAY AND IDLE TIME			CR	252		796 38
FUEL	4240				4,528 60	
FUEL TAR DIST	4241		5056 20	5056 20	4926 60	129 60 CR
GASOLINE	4250	6549		6549	5500	1049 CR
COAL	4320	10698 30		10698 30	9889 80	808 50
COKE	4330	12450		12450	320	121 30
COKE DUST	4340	3766 0		3766 0	4209 0	443 0

EXHIBIT 13

twelfth of the month and for the most recent months it has been issued to departmental supervision on the tenth.

Consolidated and Summary Works Expense Statements

The Consolidated Works Expense Statement (Exhibit 13) is a summary of the responsibility statements by detailed works cost and expense accounts. It is used by our cost bureau and our statistical division to analyze over-all monthly variances for purposes of a monthly operations letter to top management. This report is also used to get information on specific items, thus making unnecessary the special processing of punched cards or the maintenance of detail ledgers. A Summary of the Consolidated Works

EXHIBIT 13

NATIONAL TUBE COMPANY - NATIONAL WORKS

SUMMARY OF CONSOLIDATED WORKS EXPENSE STATEMENT

March - 1948

Account Title	Current Month				Prior Month	
	Actual at Standard	Budget	Variance	%	Variance	%
Materials	2,917,068	2,926,475	10,643 CR	.48 CR	3,908	.19
Operating Labor	60,362	63,658	3,296	5.18	2,114	3.76
Service Labor	67,399	66,411	1,712	1.89	1,045	1.65
Supervisory, Technical, and Clerical Labor	38,919	38,980	61	.16	223	.57
Labor Pension and Retroactive Payments	1,353	-	1,353 CR	-	1,879 CR	-
Repair and Maintenance, Equipment Inspection and Relocate and Rearrange Service	66,435	60,827	5,818 CR	9.60 CR	4,751 CR	7.71 CR
Fuels	61,293	59,609	4,684 CR	7.86 CR	4,772 CR	9.01 CR
Utilities	73,732	78,755	3,023	3.84	3,681	4.76
Tools and Operating Supplies	11,777	12,958	1,181	9.09	2,827	6.01
Transportation Service	37,082	32,852	4,230 CR	12.81 CR	5,113 CR	17.42 CR
All Other Services	80,946	89,689	8,743	9.75	6,827	8.52
General Plant Expense	27,160	25,839	1,679	14.34	3,468	13.38
GRAND TOTAL - NATIONAL WORKS	3,799,255	3,795,253	4,002 CR	.16 CR	6,580	.21

EXHIBIT 14

Expense Statement (Exhibit 14) is prepared for top management. Here all costs are stated in the primary expense classifications. For each classification the actual at standard is compared with budget, and variances and variance percentages to budget exhibited.

Occupational and "Make-Up and Delay Time" Reports

A monthly Occupational Report (Exhibit 15) is prepared. The occupational report is a report of hours and earnings by occupations and elements of earnings within each occupation, such as incentive-direct labor, check rate-direct labor, incentive-indirect labor, check rate-indirect labor, make-up, delay, repairs, mill changes, other, and premium labor expense. This detail is in-

INDUSTRIAL ENGINEERING DEPARTMENT — OCCUPATIONAL REPORT BY DEPARTMENT AND RESPONSIBILITY — FOR MONTH OF FEB 1948

DEPARTMENT AND OCCUPATION TITLE	EMP. NUMBER	SOC. SEC. NO.	INS. PLAN CLASS	JOB CLASS	SHIFT	STRAIGHT TIME HOURS	STRAIGHT TIME AMOUNT	PREMIUM OVERTIME HOURS	PREMIUM OVERTIME AMOUNT
NORMALIZER HEATER	284	770000	12	11	1	2240	34272		
					2	2240	35168		
					3	2320	36888		
NORMALIZER HEATER HELPER	284	770100	04	11	1	2240	27104		
					2	2240	28000		
					3	2320	29464		
STAMPER	284	770400	03	11	1	2240	26208		
					2	2240	27104		
					3	2320	28536		

EXHIBIT 15

valuable to the industrial engineers in the development of detailed analysis of occupational earnings.

A make-up and delay time report (Exhibit 16) to top management summarizes by department the make-up and delay costs which were reported in detail by occupation on the last mentioned exhibit and in the responsibility and daily cost statement. Current month's make-up and delay costs are compared with the previous month's.

Fair Day's Work Program

As a result of an agreement between management and the union to develop incentive plans designed to provide a "fair day's pay" for a "fair day's work" and also as a result of our recent wage inequity elimination program, which established new standard hourly rates for each occupation, certain occupations and individuals became subject to standard hourly rates in excess of average hourly earnings under the existing incentive plans. These occupations or individuals were "overtaken." This situation necessitates revisions of incentive plans. The account-

NATIONAL TUBE COMPANY - NATIONAL WORKS
PAID-FOR DELAY TIME - BY DEPARTMENT
MARCH-1948 AND FEBRUARY-1948 *

	MARCH	FEBRUARY
Delay	$ 18,033.53	$ 17,050.77
Make-Up	5,043.27	5,176.81
TOTAL	$ 23,076.80	$ 22,227.58
DELAY ANALYSIS:		
Open Hearth	81.72	112.20
Soaking Pits	143.58	186.05
Blooming Mills	2,604.41	2,512.47
Conditioning	137.27	145.46
Rotary Hot Mill	809.64	786.15
Seamless Hot Mill - Spare Parts & Tools	22.69	19.48
Warm Working	31.84	8.03
No. 1 Seamless Finishing	7,056.21	6,752.19
No. 2 Seamless Finishing	5,670.19	5,250.78
Upset & Normalize - General	1,284.30	1,023.64
Oilhelt Lathes and Finishing	191.68	244.32
	$ 18,033.53	$ 17,050.77
MAKE-UP ANALYSIS:		
Blast Furnace	1,113.47	1,405.42
Open Hearth	81.90	103.61
Blooming Mills	1.27	5.30
[illegible] Crusher	64.85	14.58
[illegible]	[illegible]	78
Locomotive Eng.	16.05	
Stocking and Shipping	102.72	108.03
	$ 5,043.27	$ 5,176.81

EXHIBIT 16

ing department has the responsibility of furnishing management the necessary figures to use as a basis for these revisions. This work is an essential part of the company's over-all fair day's work program. A related analysis of the efficiency of incentive plans is shown in Exhibit 17 and is made from the same basic payroll cards that were prepared for gross payroll, daily cost reports, responsibility statements, and other reports.

The top portion of the exhibit presents the final result for each of the plans analyzed. The lower portion shows the detail of the analysis by occupation and clock number. It is interesting to note disclosures afforded by the analysis of Plan No. 428. The plan involves the occupation of "plug turner" and covers an operation in the seamless hot mills. It covers one occupation and four employees. The analysis indicates that one man was "overtaken" despite the fact that the "average actual hourly earnings" of $1.33 exceeded the average standard hourly wage scale of

NATIONAL TUBE COMPANY - NATIONAL WORKS
FAIR DAY'S WORK PROGRAM

PLAN NO.	PLAN TITLE	DEPARTMENT	QUOTA NUMBER OF OCCUPATIONS	QUOTA NUMBER OF EMPLOYEES	OCCUPATIONS OVERTAKEN	NO. OF MEN OVERTAKEN	AVERAGE STANDARD HOURLY SCALE	AVERAGE ACTUAL HOURLY EARNINGS	RATIO ACTUAL TO STANDARD
66	Ladle Lining	Bessemer and Open Hearth	2	3	None	None	1.52	1.80	118.42
110	Hand Scarfing Billets	Blooming and Bar Mills	4	22	None	None	1.39	1.63	117.27
195	13" Rolling Mill	Bar Mill	12	24	None	None	1.37	1.71	124.82
* 420	Plug Turner	Seamless Hot Mills	1	4	1	1	1.29	1.33	103.10
448	8" Cut-Off Machines	Seamless Finishing	1	6	1	6	1.27	1.33	86.65

NATIONAL TUBE COMPANY - NATIONAL WORKS
FAIR DAY'S WORK PROGRAM

PLAN NO. 420 SEAMLESS HOT MILLS - TOOLS & SPARE PARTS - RESP. 274 SEAMLESS HOT MILLS

OCCUPATION TITLE	CLOCK NUMBER	OCCUPATION CODE	JOB CLASS	STANDARD HOURLY EARNINGS	ACTUAL HOURLY EARNINGS LESS MAKE - UP	MAKE - UP AMOUNT	RATIO ACTUAL HOURLY EARNINGS TO STANDARD
Plug Turner	11625	9030	6	$ 1.29	$ 1.44	-	111.62
	11543	9030	6	1.29	1.37	-	106.21
	11423	9030	6	1.29	1.30	-	107.75
	11276	9030	6	1.29	1.12	$ 20.91	86.82
				$ 1.29	$ 1.33	$ 20.91	103.10

EXHIBIT 17

National Tube Company

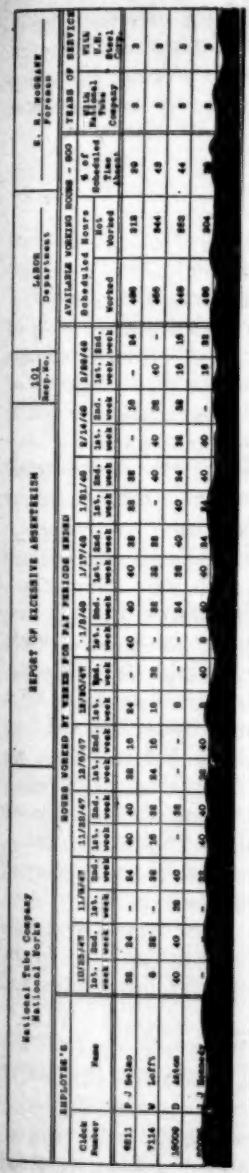

EXHIBIT 18

$1.29. The lower exhibit reveals that the only man who did not "make out" earned only $1.12 under the plan, as compared with the standard hourly earnings of $1.29. Why should three men make out and one not? Is this man incapable of doing his fair share? Or are three men sufficient for this occupation? Is lack of material the answer? Opportunity to investigate these possibilities is afforded by the analysis.

Analysis of Absenteeism

The report of excessive absenteeism (Exhibit 18) is a special analysis made at periodic intervals from the "exception cards." It is designed primarily to disclose chronic absentees and permit corrective action. A secondary purpose of this report is to reveal the effectiveness of each scheduling foreman in controlling absenteeism. One of these reports is prepared for each scheduling foreman. The report exhibited is directed to Foreman McGrann. It is a report card on his absentees. Later, a follow-up report will be made to McGrann showing the improvement, if any, that he has been able to make.

It is interesting to note that our first such absentee report disclosed that 80 per cent of the chronic absentees were confined to less than six per cent of our scheduling foremen. It is apparent

from the exhibit that a number of men seem to average about three days of work each week. Let us look at this condition from a cost control standpoint. Do we need these men or are we paying premium earnings to get the jobs done or are we carrying extra men on the roll to anticipate absentees?

Advantages Realized

We have presented here a few of many reports, the preparation of which has been facilitated or made possible by the payroll system described in the earlier portion of the paper. They are timely, comprehensive, and informative reports which form the basis of accounting service to management. These reports present business facts, organized and interpreted in a form usable to all levels of management, leading the way to cost control and cost reduction in maintenance and mill operations where savings count most. They form the basis for forecasting labor requirements at various levels of operations and for determining the break-even point at various levels of production.

What the Gains Have Been

Some of the benefits which, even at this early date, have been obtained from the system are (1) payroll accuracy, (2) gross earnings ledger, (3) a basis for timely accurate daily cost data, and (4) simple, compact, easily auditable payroll records. With these benefits alone, a substantial saving was realized in both time and personnel. These are accomplished facts. But potentially we have tapped only a portion of the possible benefits. With refinements in steel quotas and strict enforcement, the principle of scheduled labor can give management a cost control tool that is positive and effective. Special reports can now be produced more quickly than formerly and can be made available in time to serve as a basis for top management decisions. These reports almost always carry an "urgent" label and this is particularly true in the case of reports required for purposes of wage negotiations and changes in production normals.

It would be difficult to identify the benefits with any particular feature of the system, but several very important ones have played a real part:

1. Basically the pattern of the system is simple. It was installed in its entirety at the close of a pay period and

was effective immediately from that date. Payroll and month end closing requirements were met without continuing the old system on a dual basis.

2. The system is engineered to handle mass volume economically on a centralized basis and retain decentralized control.
3. The volume of recording is reduced to a minimum through exception accounting, reducing clerical work and the possibility of errors accordingly.
4. Tabulating machines are used only for the applications for which they are best suited. Prior to this system, costs and statistics accounted for thirty per cent of the tabulating bureau's capacity, while today they account for sixty per cent. This was accomplished with a reduction in tabulating bureau personnel.

General Applicability of the Basic Principles Involved

We hope that we have been able to provide a picture of our labor accounting system. It has not been the intention to represent this specific system as anything more than one which meets our requirements. We do believe, however, that many of the basic principles can be adapted to fit almost any business. They apply equally well to manual systems and to mechanical ones. In our system, for example, we use one basic card as the source of more than twenty separate labor reports and records, but new developments in methods of record keeping have made it possible to utilize this same principle in manual and other types of mechanical systems. Exception accounting is an example of this. We have used it in a mechanical system to handle the wage roll. Others are using the same method in the handling of salary payrolls.

None of the component practices is new. We have attempted to fit a number of established principles into a system designed to do three things:

1. Get an accurate payroll.
2. Provide improved service to management.
3. Obtain cost reduction in the accounting department.

We have reinvested a portion of the cost reduction obtained in expanding the scope of our reports to management, reports which we believe lead the way to better control of operating costs. This is labor accounting for cost control.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, February 1, 1949

Most Profitable Product Volume—Taking Account of Costs and Competition
by Leonard A. Doyle

•

Spreading Overhead to Cost Centers on the Basis of Standard Earned Hours
by Clarence A. DeLand

•

Practical Internal Control—A Case Study in the Motor Carrier Industry
by Phillip L. Anderson

•

Cost Control for Sponsored Research in a University
by Norman N. Barish

•

The Employee Rating Side of Wage Administration
by Carl L. Becker